

A challenge for toxicologists

Joshua Lederberg is a geneticist, a Nobel Laureate, and president of Rockefeller University. He spoke earlier this year in New York City at a briefing held at the World Environment Center, a nonadvocacy information service of the United Nations Association of the U.S.A. Here, verbatim, is part of what he had to say.

With all of the enormous expansion both in quality and in quantity—that is, in the variety and total material—of the chemical industry, I believe today that we're in a far healthier position than we were 30 years ago. Thirty years ago, there were fewer substances being emitted, but the abandon that they were being dealt with! You had workers walking knee deep in solvents and paying absolutely no attention to them. Since then, there has been a sharp increase in vigilance. With respect to a wide variety of substances, I am quite confident that the average exposure to many of these chemicals is down by a factor of 100 or 1000 compared to what it was in the early 1950's, just on account of the awareness that has been generated, the public sensitivities about these matters. There is no major industry today that does not now have a deeply ingrained environmental apparatus—procedures, bureaucracy, and doctrine—with respect to control of environmental problems. This is an enormous advance over what was the case 30 years ago.

We have at this point, of course, the responsibility to work out procedures that will provide for appropriate surveillance of new substances, for prevention of human exposure where it really is of some consequence. This in turn presents an enormous challenge to scientific enterprise; it is just beginning to be met.

If there is any message that I would like to see conveyed it is the gross inadequacy of our present knowledge base to face properly the enormous environmental challenge that we have at the present time.

I think the testing of substances could be greatly improved, improved above all by better understanding of the mechanisms by which these substances work. Right now there is almost no rationale for deciding whether the mouse, the rat, the rabbit, the guinea pig, or the monkey is going to be the better model for effects on human behavior. In fact, very few substances have been tested using more than one species in order to build up a body of theory to project in what way the human is likely to be more or less like other animals.

For that reason, I have felt a particular priority should be given to that discipline that hardly exists today, which I would call comparative toxicology. When it comes to toxic substances the prevailing doctrine is to find the most sensitive animal and if you can get a toxic effect, there is a potential hazard in man. Therefore, under most circumstances, you need to abolish the substance if you can produce cancer in that animal. Well, I can't argue against that in any affirmative way, with the present state of our knowledge, but it is obviously fraught with all kinds of difficulties and false positives. It is being excessively rigorous in a few cases when there are 10,000 other things that haven't been looked at yet.

First of all, understand that the one or two or three hundred millions of dollars a year that we're now spending on routine animal tests are almost all worthless from the point of view of standard-setting. It may be appropriate for setting alarms.

I would think the most immediate solution is to redeploy some of our resources. The resources are not only money, there is the time and effort. The whole quality of the field of toxicology has been so drowned by the requirement to do these kinds of tests that that, in itself, has made it a less respectable discipline from the point of view of more fundamental biological interests.

The point I am trying to come down to is that it is simply not possible with all the animals in the world to go through new chemicals in the blind way that we have at the present time, and reach credible conclusions about the hazards to human health. We are at an impasse. It is one that has deep scientific roots, and we had better do something about it. □